Colony of Seychelles.

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ANNUAL REPORT

ON THE

DEPARTMENT OF AGRICULTURE

FOR THE

YEAR 1929

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ANNUAL REPORT

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CHAPTER I.

General Remarks.

During 1929 the routine work of the department was carried on without the assistance of the Inspector of plantations who returned to the Colony in October, after 18 months absence, a short part of which time he spent at the Imperial College of Agriculture at Trinidad going through a course in Mycology and Entomology adapted particularly to the study and control of such insect pests as those which are devastating the coconut plantations of the Colony to an alarming extent. On his return, one of the two Assistant Inspectors of plantations was promoted in the service and was replaced in the department by the officer who had acted in lieu of the Inspector, during the latter's absence. There was otherwise no change in the staff of the department during the year under review.

The Director continued 1o. running the Botanic Gardens to which experimental plantations are annexed; 2o. upkeeping the town gardens; 3o. reafforesting the mountains above the Niol reservoir; 4o. exploiting hardwood timber for the Public Works Department from these and other small Government reserves; 5o examining plant diseases on estates; 6o. reporting on applications made by landed proprietors for Government loans which amount to Rs 411,600; 7o. working a small board in connection with the sale and purchase of licensable produce; 8o. running an Excise Department and a small research laboratory which is being gradually extended. He also acted as Chairman of the Fisheries Committee and as an ex-officio member of the Planters' Association Committee.

He accompanied in July and August His Excellency the Governor on a visit of investigation to the outlying islands during which 10 of the most important ones were inspected and a distance of more than 2,000 miles covered in a small sailing vessel. He also acted as Visiting Magistrate during the trip which lasted 32 days. A separate report, with a preface by His Excellency the Governor on the subject, was published by the Printing Office in December.

CHAPTER II.

Expenditure, Receipt, sale of plants.

	Rs	Cts
Receipts from plantations	1,498	38
Sale of timber from Crown Lands	5,177	00
Rents of Crown Lands and buildings ...	26,848	64
Royalty and export duty on guano... ...	28,364	00
Total Receipts ...	61,888	02

The total expenditure under agriculture and Crown Lands amounted to Rs 29,668.

CHAPTER III.

Introduction of Plants.

Attempts to introduce new rare plants from other countries were continued. Among these the following were grown successfully:—

Calopogonium mucunoides	from Java
Desmodium stipuliceum	„ „
Indigofera endecaphylla and others	„ „
Vigna hosei	„ „
Tephrosia candida and others	„ „

Crotolaria usambariensis	„	from Java
Bauhinia manandra	„	„
Duranta stevastachys	„	„
Nephelium mutabile	„	„
„ lappaceum	„	„
Lansium domesticum	„	„
Sorghums 4 varieties of the heavy yielding types	from	Tanganyika.
Casuarinas, quadrivalvis	„	Bermuda
„ cunninghamii	„	„
10 species of leguminous cover plants	„	Kenya
Psidium araca	„	Uganda
„ sinensis	„	„
„ montanum	„	„
Acacia brachistachia	„	„
Hibiscus mutabilis	„	„
Cassia ligustrinum	„	„
Poinsettia pink	„	South Africa
Gardenia florida	„	„
Ficus carica	„	„
Alœ arborescens, &c	„	„
Acacia decurrens	„	New South Wales
Eucalyptus alba	„	„
„ miniata	„	„
„ corymbosa	„	„
„ melliodora	„	„
„ saligna	„	„
„ eximia	„	„
„ rostrata	„	„
„ crebra	„	„
Nicotiana tabaccum (improved varieties) ...	„	Swaziland
„ „	„	Bermuda
Lonicera scarlet trumpet	„	England
Ampelopsis Veitchii	„	„
Ajowan (Carum copticum)	„	Punjab
Grafted mangoes (Jaffna and Champodam) ...	„	Ceylon

Various fodder plants such as :

Setaria sulcata, Hyperrhenia rufa, Saccharum spontaneum, Paspalum larranum.

Among the plants that flowered and fruited for the first time, including others such as Palaqium gutta, Macadamia ternifolia, special mention is made of the Rumbutan (Nephelium lappaceum) re-introduced from Java in 1926. Attempts to grow this plant successfully were made as far back as in 1906, but the few seedlings raised at that time never fruited for the simple reason that they bore staminate flowers only. In 1926 10 seedlings were set out a short distance apart and only one bore pistillate flowers and came into bearing in 1929. The others were all male plants. The fruits were declared by one and all to be excellent in spite of the flesh adhering to the stone and not loose as in the letchi. This much detracts from the great value of this fruit tree which thrives in the low country where letchi is out of place, this latter species bearing at long intervals in Seychelles miniature fruits at high elevation only.

A considerable number of cover plants has been introduced during the last 5 years, and the attention of planters has been called to the necessity of using them as green manures and also as a check against erosion on steep land. Centrosema pubescens is already a favourite plan among few planters who are leading the way, while others prefer Tephrosia candida, Vigna hosei and Indigofera endecaphylla. For a long time the indigenous Desmodium heterophyllum has been known in the Colony as a cover plant, but some of the new cover plants from the East are undoubtedly more vigorous in growth and make a better cover when the soil is rich enough to support such a type of vegetation. To the numerous worn out soils of the Colony, where manuring is still unknown, the local Desmodiums are better adapted. Calopogonium under experiment makes a better cover than Centrosema in poor soils. Tephrosia candida is however by far the most promising of all these cover plants in ordinary soil and when set out in lines 10 to 15 feet apart, the bushes do not conceal the coconuts that fall on the ground to an extent which can preclude the use of such a powerful leguminous shrub. It seeds freely in Seychelles and will soon be propagated on a greater scale.

CHAPTER IV.

The coconut industry.

The coconut crop for the year under review may be apportioned as follows, as compared with that of the two preceding years :

	1927.	1928.	1929.
Nuts converted into copra... ...	29,978,000	34,825,000	31,921,750
„ „ „ oil	68,200	48,200	9,090
„ „ „ soap	10,000	...	10,000
„ exported as such	12,500	27,500	19,360
„ consumed locally	4,000,000	4,000,000	4,000,000
	34,068,700	38,900,700	35,960,200

The reduction of 3,000,000 nuts, as compared with the crop obtained last year, is due to the attack of scale insects following dry weather.

The meteorological returns do not show a shortage of rain during 1929, but a rainless season from May to November paved the way for a more severe invasion of scale insects which are much less kept under control by means of natural parasites during periods of drought. These two factors affecting the crop are interdependent, as the multiplication of scale insects depends on climatic variations as well.

The rainfall of the colony is supposed to be derived from a conflict between two air currents which prevail in opposite directions : S.E. & N.W. When these two currents are of nearly equal intensity and meet just above the archipelago, rain occurs, but the rainy season depending on such variable factors cannot be necessarily the same from year to year. It often happens that the rainy season begins in November and ends in March without interruption, covering 5 months, but at other times, as for example during the year under review and afterwards, the rainy season was spasmodical, beginning in November but with an intervening drought in December, January and February and copious rains again in March at the time of writing. It is for this reason that the rainfall should better be tabulated from June to June instead of January to December ; the November and December rains, which may or not occur during these months, affecting the total rainfall registered in any one year from January to December in a marked degree.

By tabulating the rainfall a variation of 70 o/o in the total rainfall occurs from year to year.

An attempt was made during the year to start an agricultural survey of the whole Colony. The area under coconut culture was found to amount to the following figures. This preliminary survey was however made without the assistance of a surveyor and without having access to the figures given by the landowners for taxation purposes which are confidential.

Area in acres under coconut culture.

		Annual crop
1. Outlying Coral islands	6,110	9,924,000 nuts
2. Granitic islands Mahé Group	15,000	18,058,000
3. do do Praslin Group	7,130	8,464,000
	28,240	36,446,000

Coconut culture in the coral islands has been considerably extended and improved during the last few years and the whole area under cultivation is not yet in full bearing everywhere. The crop on these islands is increasing rapidly. In the granitic islands coconut plantations have occupied the land for a greater period of years, leaving less room for extension. Some coral islands have trebled their crops within recent years with a production reaching sometimes 4,000 nuts per acre, while the average crop on the granitic islands rarely exceeds 1,000 nuts. Many estates have however changed hands recently in Mahé and Praslin, and the new landowners from India are endeavouring to extend coconut culture in the two districts in question on land which had hitherto been considered as being too poor for such a proposition. In other parts of the same districts coconut culture on the other hand is being given up by many old residents who justly consider their land as being beyond the zone of coconut culture, as far as elevation and quality of soil are concerned.

It has been found difficult to circulate questionnaires in order to obtain reliable statistics from all planters who are more or less inclined to consider enquiries of this nature by Government as being the first step towards an increase of taxation.

It is not to be supposed that coconut culture can freely be made successfully on all coral islands, a few of them being handicapped by the presence of a hardpan which begins to form as a small conglomerate in patches and ends by forming walls 6 feet deep right down to the water level. It is the coral sand which is cemented into limestones much in the same way as beach sandstones are formed. In both cases the hardpan is formed by the cementing action of solutions of lime rendered soluble by the presence of carbonic acid derived from the atmosphere and from guano beds and percolating through the porous ground. When the guano beds do not occur on some islands the coral sand is not transformed so much into conglomerates, but remains very poor in fertilizing elements. Guano is indispensable on

these islands to keep up the yield of coconut palm, in spite of its detrimental cementing action which has to be combated. In the granitic islands the laterite soils are often too shallow for coconut culture. As they are all steep, water percolating in the subsoil supplies a considerable amount of food elements to the roots of the palms which are thriving on many parts of Mahé and Praslin at low elevations. On the mountain sides, above 800 feet elevation, the coconut palms are usually deprived of the soluble elements which at low elevations are contained in the water percolating from higher grounds and are further handicapped by permanent moisture, shallow land and fungus diseases.

Much anxiety was felt during 1929 as regards the fall of £8 in the price of copra on the London market. The cost of shipping copra to London amounts to :—

Freight	£ 3. 12.
Commission, insurance	„ 1. ...
Loss on weight	„ 1. ...
Storing, weighing	—
Marking and shipping	„ „ 8.
	£ 6. 0.

It costs £ 3 only to ship copra to Durban where however the selling price is £ 2 lower than in London and the market far more limited. More rapid delivery and payment is practically the only inducement to sell copra preferably in Durban where the market can however absorb only half the production of Seychelles.

Under these circumstances the price for nuts sold locally went down to Rs 28 per thousand instead of Rs 40–45. As it takes 6 to 7,000 nuts to make a ton of copra, one can imagine the alarming position in which the coconut industry has suddenly been placed. It can be calculated that copra selling @ £20 in London a ton leaves very little profit, if any.

The attack of scale insects is as usual very detrimental in some districts and hardly noticeable in others, although on the whole the present outbreak is far more wide spread and increasing than any previous one. The trees are attacked spasmodically by the yellow scale (Pinnaspis buxi) but this attack is generally followed by a severe infestation of the thread scale (Ischnaspis filiformis) which is of a more permanent nature. In another chapter the steps taken to combat these two pests during the year are enumerated.

CHAPTER V.

Vanilla

The vanilla crop for 1929 amounted to kilogs 4,607 of beans and it is the best crop on record for the last 4 years. It was only kilogs 1,311 in 1928. The culture of this orchid is relegated to the drier districts of Praslin and even there it is hardly a paying proposition with a selling price of Rs 6 per kilog on the spot. The crop for the year under review was anticipated to be a larger one, but the drought which prevailed caused in many plantations a withering of the vines and a shedding of the beans before the ripening time. The culture of perfume plants, mostly patchouli as an intercalary crop between rows of coconut palms, and that of cinnamon at higher elevations, is a better paying proposition. The loss thus caused by the abandonment of vanilla culture and the fall in price of vanilla is now partly made good by the production of essential oils. A vanilla crop of 100 tons at least @ Rs 6 a kilo would be required to represent the present revenue derived from essential oils (Rs 600,000).

CHAPTER VI.

Essential Oils.

The production of essential oils in the Colony amounted to the following figures for the last 5 years :—

	1924.	1925.	1926.	1927.	1928.	1929.
Cinnamon leaf oil litres	22,216	42,241	44,723	59,007	59,807	66,311
„ bark oil „	140	19	—	—	33	—
Patchouli „ „	1,025	551	1,305	1,054	2,325	4,324
Basilic „ „	144	69	111	20	10	4
Lemon grass „ „	79	71	195	236	148	—
Clove leaf „ „	1,025	3,800	—	49	—	38
	34,629	46,751	46,334	60,366	62,323	70,677

The declared value of the essential oils produced in 1929 amounted to Rs 616,528. It can therefore justly be said that the essential oil industry has largely replaced already that of vanilla of which the best crop on record never exceeded 70 tons, although of course prices used to be much higher than now.

Justice was done during the year to the value of Seychelles patchouli oil, as compared with Penang oil, by the Director of the Imperial Institute who caused Patchouli leaves obtained from the manager of the Seychelles Produce Company to be distilled under his supervision. The report, published in the Bulletin of the Imperial Institute No 4 of 1929, was translated and reproduced in the local paper. It shows that, with proper means of steam distillation at a pressure of about 7 kgs per sq. inch, a common practice in the colony, it is possible, even without previously fermenting the leaves, to obtain an excellent yield of oil ; the contents of the oil obtained either from fermented or unfermented leaves, and its solubility, comparing favourably with that of Singapore oils. It was also found by two firms of essential oil distillers in London that the second portion of the distillate from unfermented leaves was more nearly approaching commercial patchouli oil than the other three samples submitted to them, which consisted of the 1st portion from the unfermented leaves which was next in value, followed by the 2nd and 1st portions respectively from the fermented leaves. In conclusion it can be said that if the prejudice of the buyers against Seychelles patchouli oil could be overcome, it should compete favourably with Singapore oil which fetches 5/ more per lb. Since the publication of this report, there is already a better demand for Seychelles patchouli oil in London and a better profit derived therefrom in the Colony.

In many so called marshy grounds at the mouth of rivers where good alluvial soil has accumulated, very high crops are gathered reaching sometimes a ton of dry leaves per acre per annum, as compared with 350 kilogs which is the average crop in the Colony. In these marshy grounds the leaves are said to be thicker and larger than usual. In many other places a yield of 54 litres and over of oil per ton of leaves has been recorded and this is considered much above the yield in Singapore, which according to Mr Eaton never exceeds 45 litres.

The market price of cinnamon leaf oil still amounts to Rs 6 per kilog on the spot and this price is remunerative. It had however a tendency to go down to Rs 5 towards the end of the year. The blow given to the industry by the competitive manufacture of Eugenol from Guaiacol and Safrol begins to show, but it is hoped that it will take some time before the prejudice against Eugenol from Guaiacol, which possesses a different odour, disappears and before Eugenol from these sources drives the Eugenol from oil of clove and cinnamon leaf from the market.

The market price for Clove oil which always used to be higher than that of cinnamon leaf oil fetched a lower price than the latter at the end of 1929. It is uncertain whether this is due to the non-phenolic portion (i. e. aldehydes &c.) of cinnamon leaf oil being more valuable commercially that the non-phenolic portion of clove oil.

Upon the recommendation of Dr Harold Brown of the Imperial Institute seeds of Carum Capsicum (Ajowan seeds) were introduced during the year through the instrumentality of the Director of Agriculture, Punjab, India. An experimental plot is being devoted to this plant which was found in 1917 to produce seeds containing 9 o/o of thymol instead of 3 to 4 o/o contained in the seeds of the same plant grown in India, although the distilled oil itself contained a little less thymol than Indian Ajowan oil ; 38 o/o instead of 40-45 o/o. Ajowan is unfortunately a plant of delicate growth and has to be treated as a garden plant in the Colony, the heavy rainfall during 6 months of the year being too much for it. It is during the dry season that the new experiments will be continued.

A few beds in the experimental plots were devoted during the year to the culture of Dill (Anethum graveolus) which appears to be stronger in growth and more productive than Ajowan. Dry seeds of the plant have been forwarded at the end of the year under review to the Imperial Institute for examination. The yield of seeds was at the rate of 500 lbs per acre.

The culture of palmarosa, Andropogon (Cymbopogon) martini, is being extended by one planter on the hills. The results obtained as regards yield of oil per acre are not yet forthcoming. This plant is of more delicate growth than that of other citronellas and it has been found in some cases that it has a tendency to form a kind of rosette on the ground instead of shooting upwards to form a clump 3 to 4 feet high. The two varieties of Palmarosa are known to occur in Seychelles. It is however by submitting samples of oil to the Imperial Institute that the planter in question has succeeded in growing the true palmarosa called Motia in India. The other variety (Sofia) yielding a different and much less valuable oil (ginger-grass oil) occurs in other places which are well known to me and I am doing my best to prevent the two plants being intergrown. They are very much the same as regards vegetative organs, although in some cases a different habit of growth may strike the observer, ginger grass being more recumbent than palmarosa. In any case, the odour of the leaves, when crushed between the fingers, is strikingly different, when a comparison is made between clumps of the two varieties which are grown side by side experimentally.

Among other perfume plants which have not emerged from the experimental stage in the colony, the following may be mentioned :

Mitcham Peppermint
Japanese peppermint
Neroli
Ylang Ylang
Java citronella
Eucalyptus (citriodora and others).

This last mentioned plant makes very quick growth in Seychelles. Its culture is recommended as it produces an oil which is very much richer in citronellal than any other citronellal containing oil ; 90 o/o or more as compared with 35—45o/o in Java citronella oil.

Ambrette seeds (Hibiscus abelmoschus) was once a favourite perfume plant in the Colony and it has escaped from cultivation and occurs wild in some places. It is worth while taking up its cultivation again and exporting the seeds, an essence is obtained from them, mostly by infusion of the crushed seeds in alcohol, which is used as a valuable fixer and modifier for all perfumery purposes.

CHAPTER VII.

Rubber.

Owing to the low price of this commodity only 2,041 lbs were exported during the year, as compared with 17,772 lbs for the last 3 years. Nearly all plantations have been destroyed and the trees used as firewood for distilleries. A few however are still left in the hope that rubber will some day take the place it deserves on the market, when the handicap from which the industry suffers from want of international cooperation will have been removed. According to a recent article in the "Rubber Age" the present consumption of rubber is not more than 12½ o/o of its potential. If the rest of the civilized world consumed raw material on the same scale as the United States, the existing rubber plantations would not be able to supply more than 1/8th of the world's requirements.

CHAPTER VIII.

Entomological and Mycological notes.

The two scale insects, Pinnaspis buxi and Ischnaspis filiformis, known respectively as the yellow and black thread scales, have spread to such an extent in Mahé and La Digue for the last 7 or 8 years that it is no longer possible to keep them in check by cutting down the attacked leaves, and burning them after laying them on the ground for 7 or 8 days in order to allow the parasitic fungi and predaceous insects to escape partly from destruction at the same time.

For the last 25 years at least epidemics of scale insects have been known to occur spasmodically in the Colony. At one time it was the black scale or the white scale Aspidiotus ficus, or Chionaspis inday, which infested the plantations in the same way. At others the scale insects known under the name of Aspidiotus dictyospermi, A. lataniæ, A. Ansei, A trilobitiformis, Mytilaspis sp. attacked the midribs and leaf-bases of the trees everywhere in the archipelago, but these insects were less conspicuous to the eye of a layman although they did nearly as much damage as the two insects that are incriminated to-day. All the 5 above mentioned insects are still present in many plantations and a complaint is often received as regards their virulence on widely separated estates. It seems that they paved the way for the invasion of the new scale insects that have become a pest of greater virulence, after the havoc done by the others during a long period of years.

When I left for Mauritius early in 1921 Pinnaspis buxi occurred on wild pandanus (vaquois) on the hills and in the low country and Ischnaspis filiformis on coffee bushes and coconut palms in the North of Mahé. I called the attention of planters to these scales and pointed out to them that they would become very destructive pests, should they not be kept properly in check. When I returned to the Colony in 1924 I noticed that many more plantations were attacked by these insects. The planters attributed to them all sorts of diseases including the budrot. I immediately made a survey of the whole island, and discovered that there were no less than 400 localities that had become contaminated. It was too late to stop them spreading all over the island.

It must be mentioned that the two scale insects incriminated at present are known to occur in coconut plantations all over the tropical world and that in the West Indies and elsewhere their havoc is attributed to bad physical soil conditions and lack of nourishment in the ground. In other parts of the world a more dangerous scale insect of the same family, Aspidiotus destructor, is causing a havoc which is much worse than the one from which this Colony is suffering.

In Fiji, where coconut is grown on a greater scale, the havoc done by Aspidiotus destructor was so great that Mr Taylor, the Assistant Entomologist of the Department of Agriculture, was despatched to Trinidad in 1929 in search of coccinelid beetles (lady birds) which are known in that colony to rid the coconut plantations of the same insect pest. Mr Taylor stayed 6 months in Trinidad and brought back with him 5 coccinelid beetles found by him to prey on scale insects in that colony. He reared them in cages and vases on his way to Fiji and he found that Cryptognatha nodiceps was the only lady bird that bred satisfactorily and was not attacked in the Fiji cases by ants, which almost wiped out the other 4 species. As many as 1,517 living specimens of Cryptognatha nodiceps were successfully introduced in Fiji and soon liberated. Azya trinitatis, or beetle No. 2 although the most efficient species in Trinidad did not breed at all in Fiji, probably owing to the difference in the

scale of Fiji, as compared with that of Trinidad. Many adults and larvæ of the other beetles which had to be bred in tubes during the voyage were killed by mildew on the stripes of leaves on which they were laid.

Upon hearing in 1929 that these insects had been successfully introduced in Fiji, I at once wrote to Mr Nageon, who was then undergoing a refresher course at the Agricultural College of Trinidad to secure a consignment of these beetles and bring them here on his way back to the Colony. Unfortunately Mr Nageon left the College suddenly soon after an accident and other difficulties and was unable to carry out my instructions.

The lady bird beetle liberated in Fiji has done such wonderful work that many estates which had been long suffering so much from the San Jose's scale were rid of the pest within 6 months. It was also noticed that beetles, liberated on spots at a distance of 6 and even 10 miles from the estates attacked by scale, had found their way to the contaminated palms within 6 months. An example of the thoroughness of the work of the beetle was found on a young palm suffering from scale on one leaf only. There was no contaminated tree within a quarter of a mile and yet the beetles found this leaf and three adults were seen feeding on the scale on it.

The multiplication of this beetle is so rapid that the life cycle from egg to adult is 3½ weeks. Each female lays about 120 eggs per month. This means that 10 females produce 72,000 beetles in 2 months. The larvæ which bear waxy tufts are so numerous that they give the underside of the leaves a whitish appearance and their pupæ form conspicuous white patches, over 6 inches in diameter, which can be easily seen on tall trees from the ground.

There is no doubt that the introduction of such a beetle, the useful work of which sounds like a fairy tale, should it prove as effective against Pinnaspis buxi and Ischnaspis filiformis as it did against Aspidiotus destructor in Fiji, would be a boon to the Colony. It should be borne in mind that we have in Seychelles a bird, the martin, (one of the Indian Mynahs) which probably destroys all sorts of beetles including the coccinelids or ladybirds and that moreover the small black ant, Technomyrmex albipes, so common everywhere and so similar to the Argentine ant, goes far to prevent ladybird beetles from establishing themselves in our coconut plantations. Mr Nageon has been asked to collect all local coccinelid beetles and 4 winged flies that are likely scale parasites and he already reports that these insects are exceedingly scarce in the Colony. Breeding cages have been fixed up for the propagation of these beneficial insects that were said to be more common in the Colony in the past when the mynahs and the ants were less troublesome. Many specimens have already been sent to the Bureau of Entomology for identification.

The neighbouring colonies and protectorates, such as Zanzibar, Kenya, Tanganyika, Ceylon and Mauritius, where entomologists have been at work for some time, are also yet provided with beneficial beetles for propagation and steps are being taken at the Research Station of Amani and in Kenya to breed them as well as other insects for distribution purposes. The question with which this Colony is confronted is therefore either 1o. to employ a skilled entomologist in England who would come to the Colony in due time with consignment of beetles from Trinidad and other colonies. This would cost probably £500 at least and may be a failure.

2o. to wait until the Research Stations at Amani and Nairobi are in a position to allow Mr Nageon to go and study the beetles occurring there in the plantations infested with scales, to breed them and bring them over with him. This second scheme would cost less money, but it would take more time to carry it on.

Another method of combating scales has not been lost sight of in the Colony. The Director of the Imperial Bureau of Mycology forwarded in November 1929 a small consignment of pseudo-microcera Henningsii imported from Sierra Leone for transmission to Seychelles. The spores of the fungus were received in Petri dishes and were at once, according to instructions, mixed with sterilised water and spread by means of a sterilized brush to Palm oil and Coconut plants under shelter that had previously been infested with the two scale insects under optimum conditions of growth, both for the entomogenous fungus and for scales. There are hitherto no signs of the fungus having developed in the body of the scales. This fungus is known to attack in Sierra Leone Aspidiotus destructor but not Pinnaspis nor Ischnaspis. The Director ot the Imperial Bureau mentioned in his letter that he had had some difficulty in growing it in culture media at Kew. The same difficulty was experienced here in growing the spores that arrived in a more or less dry state on maltose agar at the Bacteriological laboratory of Dr Hermitte at Mont Fleuri.

Years ago, I collected several entomogenous fungi in Seychelles and had them identified in Ceylon by Dr Petch, but this was long before the Bureau of Mycology was created. Among the identified fungi a species of microcera (M. aurantiicola) was found attacking the scale known as Diaspis pentagona, an insect which is often covering entirely the stems of papaws, pigeon teas, mulberries and Flacourtias in the Colony. Another red headed fungus (Sphœrostibbe coccidopthora) was found on Mytilaspis citriodora scale attacking citrus mitis (bigarades) at Mount Sebert in 1917. Early this year (1930) a red, a black and a white fungus were found attacking the thread scale (Ischnaspis) on coconut palms at Anse à la Mouche and La Misère. These last mentioned fungi have been sent to the Bureau of Mycology for identification. None of them are widespread.

According to the authorities, too much confidence cannot be placed in the destruction of scale by beneficial fungi, local or imported. During years of heavy rainfall they are effective and nearly useless during dry periods. There is however an exception to this rule which is shown in the wonderful way in which Cephalosporium lecanii are ridding the coffee bushes

and orange trees in Seychelles from the attacks of Lecanium viride. In many places however during dry years, the same scale in spite of the fungus assumes a virulent character and is still destructive.

The importation of ladybird beetles, provided the ants and martins are kept under control at the same time, seems to be a measure of more permanent usefulness and is worth being experimented with at any cost.

Other sides of the question which are more Agricultural than Entomological should not also be left in abeyance by planters. It is well-known to-day that coconut palms are handicapped by stiff soil (red clays) and water-logged grounds. Root and wilt diseases are rife in such soils, and whatever beneficial insects or fungi are introduced these bad soil conditions have to be made good by manuring, terracing, draining the land if the attack of scale insects is to be combated. There are numerous plantations in the Colony in which a portion only of the estate is attacked by scale, owing to bad soil conditions, whilst the other parts are insect proof.

Terracing the steep land to prevent erosion, by means of walls and trenches with additional rows of cover plants, is becoming a routine work on many estates. This work should be continued and rendered more effective by thinning out the overcrowded plantations where palms are suffering from scale more than elsewhere. The work of draining the water-logged plantations on the coast should be more thoroughly carried on by the use of Armco gates and iron pipes on which the attention of planters has repeatedly been drawn. The so-called marshes or back waters along the coast are level with the sea at high tide with the result that the mouths of streams are blocked up very often by bars of sand. Unless dry walls are built along the sea and provided with Armco pipes with automatic valves to complete the drainage work, the best coconut soils of the Colony will remain water-logged. So much so that these marshes are all at the foot of the hills and that the water, not having an exit to the sea, percolates under ground and remains stagnant a few inches below the surface during months at a time, thus injuring the roots of the coconut palms to a considerable extent and rendering them more liable to invasions of scale. Drainage by deep trenching at the foot of the hills to prevent coconut plantations lower down from being submerged is also never practised.

Tanglefooting the trees with adhesite on paper to prevent ants from reaching the leaves of the palms and assisting the scales in their work of destruction is sometimes practised together with the Californian method of killing out ants, by giving them access to a dilute solution of arsenite of soda in a syrup of sugar placed in receptacles, in such a manner that the ants would get to it and carry it in a continuous supply to their nests. These methods of ridding estates from ants are not altogether successful, the ants soon avoiding the poison or gaining access to the crown of the trees by climbing up boulders or intervening shrubs that are so often kept in coconut plantations. Many planters prefer the method of burning rubbish in small heaps where ants are found to nest, which is more effective than the use of poisons and tanglefoot. The steady use of an insecticide, such as soda-rosin solution, has also been found at the Botanic Station and Government House, a very successful means of killing out the remaining ants after their nests have been destroyed periodically.

The question of destroying ants has not altogether an important bearing on that of combating the two scales from which the coconut plantations are suffering at present. These two scales, Pinnaspis and Ischnaspis, are not assisted in any way by ants in their work of destruction. Trees suffering heavily from these two scales do not harbour ants at all. Ants are the commensals of other scale insects in the Colony, but not of the two above mentioned ones with many others. This again leads me to think that the introduction of coccinelid beetles would be the best means of combating our scale insects. The destruction of birds like Mynahs, if they are in the way of coccinelid beetles, presents no difficulty. Mynahs were, it appears, introduced into Seychelles for the purpose of destroying locusts, but there are a great many islands where they do not occur and where the locusts are however not more numerous. In the meanwhile they destroy beneficial insects as well and what is worse they also attack indigenous birds including pigeons in their young stage. The same havoc done by martins in other colonies has led to the adoption of measures of destruction against them (Tahiti). As a rule, however, I think that the larger lady birds only are preyed upon by martins which do not trouble about the smaller and more effective ones and are considered very beneficial in Mauritius and India against insect pests.

CHAPTER IX.

Fisheries.

The exports from the outlying islands were:—

Guano	Tons	12,780	...	...	declared value	Rs	265,585
Tortoise shell ...	kgs	995	...	...	,,	,,	,,	26,704
Calipee	,,	4,226	...	...	,,	,,	,,	4,982
Shark fins	,,	865	...	...	,,	,,	,,	865
Trepangs	,,	6,061	...	...	,,	,,	,,	6,126
Green Turtle shell...	,,	633	...	...	,,	,,	,,	274
Salt fish	,,	...	...	...	,,	,,	,,	...
Turtle strips ...	,,	1,314	...	...	,,	,,	,,	1,234
Bird's eggs (preserved yolk)		29,170	...	...	,,	,,	,,	20,366
Fresh fish ...	,,	1,043	...	...	,,	,,	,,	214

These figures compare favourably with the exports for 1928. If guano and tortoise shell exportation decreased a little, on the other hand the other articles exported increased considerably, showing that more and more trouble is taken in the exploitation of the sea resources.

With better organisation and regular means of communication with all the outlying islands, the profit to be derived from the sea resources would soon exceed that of the land resources of the Colony.

One firm is already engaged in building an auxiliary vessel of sufficient size (50 tons) to carry on fishing operations on a large scale. Every facility is accorded by Government to this firm.

The book published by Tressler, Professor Gruvel and others on many tropical fisheries, including Indo China and the Philippines Islands, are also being broadly circulated for the benefit of local fishermen and the public.

No time should be lost in acquiring a reputation for our fisheries products on the market, as the measures of development are being adopted by the Government of neighbouring countries : Kenya, Mauritius, Madagascar. It was anticipated by the local firm engaged in fishing operations that the Kenya market for fresh fish would prove remunerative, but that firm after trial shipments amounting to about a ton of fresh fish is experiencing difficulties in obtaining an agent in Mombasa and the necessary cold storage accommodation on board the B. I. steamers although better arrangements are being made for that purpose.

A great number of other pamphlets dealing with methods of curing fish and preparing other sea resources for the market in various tropical countries were received during the year. Many methods were also shown and taught to the local fishermen by Mr Hornell during his stay in the Colony in 1927. Much progress is anticipated in the local preparation of cured fish in the near future. Shoals of migratory fish in considerable numbers, mainly mackerel (Lethrinus mœnsii), a kind of barracuda (Sphyræna fello) and a caranx (Caranx gymnostethoides) occur in the colonial waters, besides other fishes which abound all the year round on the submerged banks adjoining each of the 5 groups of islands of the archipelago. The preserving of many fish by smoking, a method which has hitherto never been used in the Colony and which is so successful in the Philippines should be taken up. Over there, this trade is in the hands of Chinese residents and their methods of operation have been described in the Philippine Journal of Science by Mr Alvin Seale.

The methods are simple enough and should be tried without delay in Seychelles. The fish are thoroughly washed and cleaned and the backbones removed. They are then put in strong brine for one day, allowed to dry two days in the sun and wind, and then transferred to the smoke room and smoked slowly for 14 days, after which they are placed again in the sun for half a day. Finally they are wrapped in oil paper and sealed in tin boxes for export.

The question of using trawlers for the capture of fish on the Coast of Africa and on the submerged banks adjoining Seychelles and Mauritius (Saya de Malha) has lately been favourably reported upon by expert biologists and fishermen. If this remunerative way of catching fish is not possible in Seychelles waters, our local fishermen should not be discouraged. They should remember that perhaps the best cured fish known is that obtained by Danish fishermen off Feroe Islands and on the west of Iceland. There the cod is caught by lines on board sailing vessels in much the same way as fishing is practised in Seychelles and I am informed by the Danish Authorities that these fishermen are encouraged to persist in their primitive methods of fishing. These methods are the outcome of long experience and the way in which the lines are arranged and hooked allows, it appears, the fishermen to catch fish of a certain size only and to catch them alive. When trawlers are used the fish of all sizes are mixed up and knocked about in the haul and most of them are killed when they are being captured by all sorts of rocky materials which are detached from the bottom of the sea at the same time. The drying and curing of this special article of commerce are done under the control of the authorities by experts. Only the best white Spanish salt is used. It appears that it is owing to this fine salt, to the pure air, gentle cool breeze of the Feroe Islands which possess an insular climate with occasional showers of rain, which compel the fishermen to store their fish repeatedly, while drying and alternatively exposing it to the sun at short intervals, that the flesh of this fish acquires a special consistency, firmness and colour unobtainable elsewhere.

The exploitation of the sea resources of this Colony can relieve it to some extent from the wave of depression from which it is suffering owing to the slump on the market for coprah and essential oils. Replacing partly the culture of coconut and perfume plants by that of other plants such as Pepper, nutmeg, Mauritius hemp, &c., which take some time to come into bearing, would keep the Colony under the wave of depression a longer time. There are besides cured fish a number of articles that can be produced out of the sea resources :—

1. The manufacture of fish oil soap (a badly needed insecticide).
2. „ „ „ fish manure, fish meal.
3. „ „ „ crude potash salts from sea-weeds.
4. „ „ „ agar agar from sea-weeds.

It is very surprising that the sea-weeds that are cast ashore at least twice a year should remain on the beach without being used by the planters, except in a few localities. It is well-known that these weeds abound in the Colony even at greater depths (30 fathoms) on the innumerable submerged banks which surround the islands of the archipelago on all sides. Professor Stanley Gardiner in 1905 collected 49 species of sea-weeds in the archipelago and neighbouring islands. Among these that are washed ashore at the turn of monsoons and during gales 2 species of Sargassum, 1 of Zostera and 3 of Cymodocea predominate.

These sea-weeds are not used generally as a fertilizer, except by half a dozen planters. Partially dried sea-weeds directly applied to the land is a most paying proposition everywhere in the world.

The difficulty of extracting the mineral potash salts which the sea-weeds contain is the cost of importing Sulphuric acid or Hydrochloric Acid which has to be used for the transformation of the carbonate of Potash (obtained by burning the weeds on large pieces of sheet iron and making a watery extract which is boiled down to crystalizing point) into Sulphate or Muriate of Potash.

During Mr Hornell's sojourn in the Colony in 1927 a species of sea-weed which grows alongside the beach in many localities all over the archipelago was prepared and sent to the Imperial Institute for examination and report. This sea-weed was reported (vide Imperial Bulletin No. 3 of 1928) as giving an excellent material for the preparation of Agar agar. The material was identified as being bleached specimens of Gracilaria wrightii var Ceylanica. On examination it was pronounced by the authorities to be comparable with the best grades of Irish moss.

CHAPTER X.

Crown Lands.

The following plants were set out on Crown Lands during the year :—

	Casuarina equi setifolia	2,112
	Other casuarinas	52
	Various palms	210
A.	Pterocarpus indica	137
	Parkia roxburghii	710
	Various citrus	99
B.	Calophyllum spectabile	225
	Various mangoes	51
	Acacias (confusa and polystachya) ...	82
	Eucalyptus (various species, mostly territicornis hybrids)	275
C.	Heritiera littoralis	541
	Mulberry cuttings	
	alba, nigra and others	200
	Chalmoogra (Hydnocarpus wrightii) ...	150
	Lodoicea Seychellarum (coco-de-mer) ...	32
	Garcinia mangostana	10
	Clove (Caryophylla aromatica)... ...	400
	Nutmeg (Myristica moschata)	52
	Afzelia bijuga (Gayac)	72
	Durio Zybethinus (Durian)	30
	Chrysobolanus icaco (Cocoplum) ...	2,500
	Albizzia moluccanna	200
D.	Trachylobium verrucosum (gum copal) ...	358
E.	Sandoricum radiatum (santol)	500
F.	Adenanthera pavonina and microcarpa ...	42
	Raphia (Ruffia)	125

The trees marked A, B, C, D, E, F, although of very quick growth are known to furnish very good timber in the Colony. It was decided to set out experimental plots at various elevations in connection with the establishment of fuel reserves in soils which proved to be too poor for the growth of Casuarinas and Eucalypti; these two trees being inclusively used as such in the Colony.

Cocoplum (Chrysobolanus icaco), 2 Acacias from Australia, Trachylobium verrucosum (gum geopal), privet (Ligustrum) were very successful in worn out soils, except the last mentioned species which has been under experiment for 3 years and which has failed hitherto to produce seeds in the low country. The 3 other species are admirably adapted to high elevations. Even in the low country they are of quick growth and as they all form a better canopy than Casuarina and Eucalyptus, they are worth a better place in the scheme of reafforesting the denuded hills of the Colony. Gum copal is, in addition, a tree which is of no small economic importance. At one time it was indigenous in the Colony, but not a single specimen was left after the trees had all been used for house and boat building. It is always better to make use of an indigenous tree than exotics such as eucalypti and wattles which tend more to reduce the water content of the soil. In the drier parts of Praslin cashew nut trees are very successfully used to prevent erosion on steep soil. The wet atmosphere on the mountain sides of Mahé is too much for them. They become thereon shy bearers and are soon attacked by white ants.

During the year a considerable amount of hard wood timber was supplied at cost price to the Public Works Department viz : 19,480 current feet of Capucin and 3,776 feet of Bois rouge or 23,256 feet in all. This supply cannot continue long. After making use of the capucin trees that have fallen on the ground nearly a century ago and those that have reached, while still standing, a dying condition, the supply will have to be considerably restricted. This hard wood has mostly been obtained from the government reserves above the town of Victoria where the denuded areas are being actively reafforested.

The influence of forests on the climate and water supply of this Colony cannot be overemphasised. The relative humidity of the air, which depends so much on the forests, and the protection of soil from erosion by trees, have often been overlooked in Seychelles in the past. These are factors which have probably much to do with the present prevalence of insect pests. Mr Nicholson who lately worked out the influence of forests on rainfall in Kenya points out, among his other very important conclusions, that evaporation from a free water surface is two and a half times greater outside than inside a forest. This sentence is worth being kept in view in the Colony where so many streams have dried up and impaired the welfare of the inhabitants. Everybody knows that on many denuded islands it is not even possible any longer to rear animals from want of good running water. Not only the hill tops of the whole Colony should be kept wooded at any cost, but banks of rivers should all be maintained under forest. This line of defence against periods of drought and shortage of drinking water can only be established by private enterprise.

Among new promising trees under experiment for re-afforestation purposes in this Colony special mention is made of Pahudia rhomboides which is self regenerating under the worst conditions of growth and Calophyllum spectabile which, although allied to the indigenous takamaka, keeps free from insect pests in a marked degree in spite of being grown among other severely attacked plants, including its congener (C. inophyllum).

Chapter XI.

Excise Returns.

The total area under sugar cane cultivation for which a licence of Rs 250 per acre per annum has to be taken under Ordinance No. 9 of 1928 amounted to 26 arpents and 1,375 square feet distributed as follows :—

	Arpents.	10ths.	Square feet.
North Mahé and Central District...	13	4	1,059
South Mahé	10	1	1,462
Praslin	1	7	4,164
La Digue		6	3,776

The area under cultivation in 1928 amounted to 32 5/10 arpents and 997 square feet. This restriction in the area under cultivation and in the number of mills and licensed shops has naturally led to more frequent illicit sales of bacca than formerly.

The number of bacca mills registered during the year amounted to 14 compared with 26 in 1928, and 22 licences instead of 26 were issued to retailers of bacca.

The number of essential oil distilleries for which a licence of Rs 60 has to be taken amounted to 30.

The revenue derived from the taxes and licences are reckoned at :—

Sugar cane plantations (Rs 250 p.a.)	Rs	5,527 50
Bacca Mills (Rs 100 p.a.)	„	1,400 00
Tax on Mill oxen (Rs 6 p.a.)	„	84 00
Bacca shop licences (Rs 180 p.a.)...	„	3,960 00
Tenders for licences	„	5,267 00
Essential oil distilleries (Rs 60 p.a.)	„	1,800 00
Total ...	Rs	18,038 50

P. R. DUPONT,
Director of Agriculture.

Department of Agriculture.
Seychelles, 31st March, 1930.

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